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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SCOTT DEWEY

Appeal 2009-002523
Application 10/823,305
Technology Center 2800

Decided: June 25, 2010

Before JOHN C. MARTIN, THOMAS S. HAHN, and ELENI MANTIS MERCADER, *Administrative Patent Judges*.

MANTIS MERCADER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant appeals under 35 U.S.C. § 134(a) from the Final Rejection of claims 1-20. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

Appellant's Invention

Appellant's Figure 3 is reproduced below:

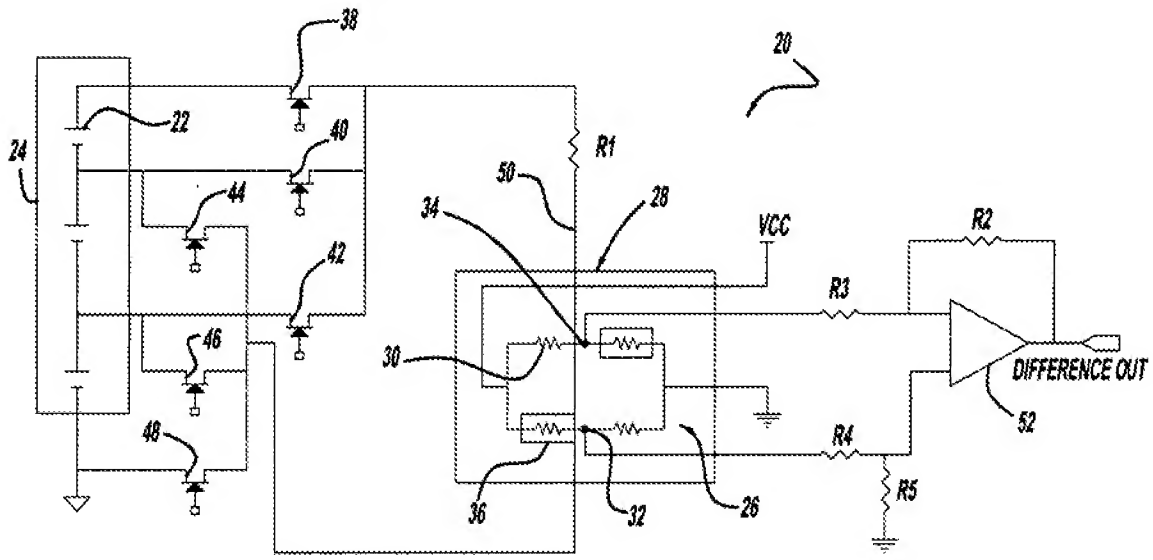

FIG - 3

Figure 3 shows a fuel cell stack 24 having fuel cells 22 and the cell monitoring system 20 which includes a giant magnetoresistive (GMR) device 28 having a wheatstone bridge 26. The wheatstone bridge 26 uses two non-shielded magnetoresistive resistors providing a greater differential voltage at the output ports 32 and 34 in response to a magnetic field. Spec. [0020].

Appellant's invention is directed to employing a giant magnetoresistive (GMR) device 28 to determine the state of fuel cells 22 in a fuel stack 24. *See* Spec. [0018] and Fig. 3.

Claim 1 is illustrative of the invention and reads as follows:

1. A monitoring system for monitoring the voltage potential of fuel cells in a fuel cell stack, said system comprising:

a wheatstone bridge, said wheatstone bridge including at least one giant magnetoresistive (GMR) resistor and two output ports;

a conductor positioned proximate to the wheatstone bridge;

a plurality of switches electrically coupled to the fuel cells and to the conductor, said switches being selectively switched on and off to separately and selectively couple each fuel cell in the fuel cell stack to the conductor and generate a current flow therethrough, wherein a magnetic field generated by the current flow through the conductor reduces the resistance of the GMR resistor and unbalances the wheatstone bridge; and

a differencing amplifier electrically coupled to the output ports of the wheatstone bridge, said differencing amplifier providing an output signal indicative of the voltage potential of the selected fuel cell.

The Examiner's Rejections

The Examiner's Answer cites the following prior art references:

Thiele	US 3,500,372	Mar. 10, 1970
Yoshino	US 4,937,521	Jun. 26, 1990
Chen	US 5,371,455	Dec. 6, 1994
Barbetta	US 6,762,587 B1	Jul. 13. 2004 (effectively filed Sep. 12, 2000)

1. The Examiner rejected claims 1-4, 6-10, 12-17, 19, and 20 under 35 U.S.C. § 103(a) as being unpatentable over Barbetta and Yoshino.

2. The Examiner rejected claims 5, 11, and 18 under 35 U.S.C. § 103(a) as being unpatentable over Barbetta and Yoshino and further in view of Chen and Thiele.

ISSUES

The pivotal issues before us are:

(1). with respect to claims 1-4, 6-10, 12-17, 19, and 20, whether the Examiner's articulated reasoning for modifying Barbetta in view of Yoshino supports the legal conclusion of obviousness; and

(2). with respect to claims 5, 11, and 18 whether the Barbetta, Yoshino, Chen, and Thiele combination teaches a fuel cell stack monitoring wheatstone bridge GMR sensor including a polarity reverser.

FINDINGS OF FACT

The record supports the following relevant findings of fact (FF) by a preponderance of the evidence:

1. Yoshino explicitly teaches that the current detecting device (col. 1, ll. 52-53) provides high accuracy in current detection.
2. Barbetta teaches a meter 13 (Fig. 1) which measures voltages of individual cells or cell groups and communicates the measurements to a monitor (col. 4, ll. 30-34).
3. Yoshino teaches a measuring device (Figs. 11-13; col. 8, ll. 32-66) having a bridge circuit including a magnetoresistive sensor 1 for accurately performing those measurements (col. 1, ll. 52-53). Appellant does not deny that Yoshino's bridge circuit is a wheatstone bridge.

4. Thiele discloses that fuel cell batteries occasionally reverse polarity due to internal faults (col. 1, ll. 30-34).
5. Barbetta's Figure 8 shows an embodiment of a multiplexer 2 (Fig. 7) that includes a plurality of switches 1 for connecting individual cell or grouped cell voltages 2 (Fig. 8) to a multiplexor output 3 (col. 6, ll. 37-40).
6. Yoshino indicates in Figure 12 that the current flow is in only one direction in conductor 3 because polarity is significant for the operational amplifiers 41, 42, as indicated by their + and – terminals (col. 8, ll. 47-59).
7. Chen teaches automatic polarity detection and, if the polarity is determined to be incorrect, polarity reversal (Fig. 1; col. 1, l. 50 to col. 2, l. 2).

PRINCIPLES OF LAW

The Examiner's rejection for obviousness must set forth articulated reasoning that possesses a rational underpinning supporting the legal conclusion of obviousness. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). The Supreme Court stated that "'rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.'" *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (quoting *Kahn*, 441 F.3d at 988).

The test for obviousness is what the combined teachings of the references would have suggested to the artisan. Accordingly, one cannot show nonobviousness by attacking references individually where the

rejection is based on a combination of references. *In re Keller*, 642 F.2d 413, 426 (CCPA 1981).

ANALYSIS

Claims 1-4, 6-10, 12-17, 19, and 20

Appellant argues (App. Br. 8), *inter alia*, that the Examiner has failed to explain why one skilled in the art would combine the current detecting device of Yoshino into the fuel cell voltage detecting device of Barbetta. We are unconvinced by Appellant's argument.

The Examiner articulated as a rationale to combine the references "the benefit of accurately reading current/voltage of each cell whilst ensuring isolation existed between the cell's high voltage and the measurement electronics, particularly since Barbetta's sensor is connected to a conductive trace" (Ans. 6-7). Thus, the Examiner has essentially provided two rationales for the combination. The first being *accuracy* and the second being *isolation*. Without deciding whether the second rationale is sufficient to support the combination, we find that the first rationale of accuracy does support the combination. Yoshino explicitly teaches that the current detecting device (FF 1) provides high accuracy in current detection. Accordingly, one skilled in the art would have been motivated to replace Barbetta's meter 13 (Fig. 1), which measures voltages of individual cells or cell groups and communicates the measurements to a monitor (FF 2), with the wheatstone bridge measuring device of Yoshino (FF 3), which has a magnetoresistive sensor 1, for accurately performing those measurements. Thus, the Examiner has provided, in the rejection, articulated reasoning

possessing a rational underpinning that supports the legal conclusion of obviousness. *See Kahn*, 441 F.3d at 988.

For the foregoing reasons, we will sustain the rejection of claims 1-4, 6-10, 12-17, 19, and 20.

Claims 5, 11, and 18

Appellant argues (App. Br. 11) that Chen does not teach or suggest a polarity reverser in a monitoring circuit for monitoring the voltage across fuel cells in the fuel cell stack where the polarity reverser reverses the voltage polarity from fuel cells so that the current sent to the conductor positioned in close proximity to a wheatstone bridge always flows in the same direction.

The combination of Barbetta and Yoshino as discussed *supra*, includes the fuel cell stack as taught by Barbetta and the wheatstone monitoring sensor of Yoshino. As noted by Appellant (Reply Br. 3), the Examiner found (Ans. 28-29) that Barbetta's multiplexer switches of Figure 8 are capable of accomplishing polarity reversal of the voltages in fuel cell stack 10, although the switches are not described as being used in that manner (FF 5). Thiele was used by the Examiner (Ans. 29) for disclosing the problem that fuel cell batteries occasionally reverse polarity (FF 4). The Examiner further found (Ans. 30) that Yoshino indicates in Figure 12 that the current flow is in only one direction in conductor 3 because polarity is significant for the comparators 40-42, as indicated by their + and – terminals, and that polarity reversal would either damage the comparators or garble the output (FF 6). Appellant has not asserted any error in these findings regarding Yoshino. The Examiner (Ans. 31), correctly, relies on Chen for a teaching of automatic polarity detection and, if the polarity is

determined to be incorrect, automatic polarity reversal (FF 7). Appellant's argument that "a reverse-polarity detection circuit is not a polarity reverser" (Reply Br. 4) is therefore unpersuasive.

Based on the foregoing teachings, the Examiner concluded that it would have been obvious to protect Yoshino's wheatstone bridge comparators and output in the above combination of Barbetta and Yoshino by automatically detecting the polarity of Barbetta's fuel cell voltages and reversing their polarity if they are determined to have the wrong polarity, a potential problem recognized by Thiele. Appellant has not asserted any error in combining the reference teachings in the above manner, instead faulting the references individually for failing to disclose the claimed polarity reverser in a monitoring circuit. The test for obviousness is what the combined teachings of the references would have suggested to the artisan. Accordingly, one cannot show nonobviousness by attacking references individually where the rejection is based on a combination of references (i.e., the Examiner conclued that the combination teaches a polarity reverser in a monitoring circuit for monitoring the voltage across fuel cells in the fuel cell stack where the polarity reverser reverses the voltage polarity from fuel cells so that the current sent to the conductor positioned in close proximity to a wheatstone bridge always flows in the same direction). *See Keller*, 642 F.2d at 426.

Accordingly, we will also sustain the rejection of claims 5, 11, and 18.

CONCLUSIONS OF LAW

(1). With respect to claims 1-4, 6-10, 12-17, 19, and 20, the Examiner's articulated reasoning for modifying Barbetta in view of Yoshino supports the legal conclusion of obviousness; and

(2). with respect to claims 5, 11, and 18, the Barbetta, Yoshino, Chen, and Thiele combination teaches a fuel cell stack monitoring wheatstone bridge GMR sensor including a polarity reverser.

DECISION

The Examiner's decision rejection of claims 1-20 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

ELD

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